

PART 504 - SPECIAL; INVESTIGATIONS, STUDIES, AND REPORTS

SUBPART A - PROBLEMS AND DEFICIENCIES

504.00 General.

(a) Engineering activities must be carried out with a high level of technical competence if the results are to be of proper quality. The appropriate level of quality can be maintained only by engineers who use high quality specifications, criteria, standards, and procedures. These tools must be constantly updated because of changes in Technology and experience. Problems, deficiencies, and failures often reflect a breakdown in the quality control of engineering activities.

(b) Special investigations, studies, and reports of engineering problems and deficiencies are needed to define clearly the conditions that led to the problem or deficiency; describe in detail the situation that exists at the time of the study, including induced damages; define additional surveys or investigations needed; determine the cause of the problem; provide recommendations for resolving the problem or deficiency; provide recommendations or changes needed to avoid a recurrence; and fully document findings in an engineering report. These reports provide the information needed to improve future engineering work and resolve possible claims or litigations.

504.01 Scope.

(a) An investigation is to be made and report prepared whenever an engineering practice, system, structure, structural element, or material does not function as anticipated. Deficiencies or failures that become evident during construction are also to be investigated and reported.

(b) An investigation is to be initiated when signs of instability or serious distress are detected. Deterioration of concrete, severe erosion in channels, movement or cracking of the embankment, malfunction of pipelines, and excessive seepage are some examples of serious distress.

504.02 Reporting problems, deficiencies, and failures.

(a) The district, area, and state conservationists are to be notified immediately of a problem or deficiency that might create a serious emergency or a failure that has led or may lead to loss of life, serious offsite damages, disruption of public utilities, or major economic losses for owners, sponsors, contractors, and SCS. The state conservationist is to telephone the Chief promptly. The telephoned report is to include such critical information as identification of the structure, project, and location and a description of the situation at the time of the call. When a major dam, Class V or larger (501.04 of

PART 504 - SPECIAL; INVESTIGATIONS, STUDIES, AND REPORTS

this manual), is affected, the state conservationist is to see that the state conservation engineer provides the report required in paragraph (d) of this section.

(b) Normal lines of communication are to be used when reporting problems, deficiencies, or failures other than those described in paragraph (a) of this section. Political and social effects are to be considered in determining the urgency of the notification to line officers and the need for informing others. Jobs in Classes I through IV (501.04 of this manual) do not usually merit special reporting because they rarely have the potential to create significant damages.

(c) If there is a significant danger to life or property, the state conservationist is to insure that appropriate authorities and owners or sponsors are notified.

(d) If there is failure or potential failure of a Class V or larger dam or other structure that may cause major economic losses, the state conservation engineer is to telephone the Director of Engineering and report the situation. The Director is to provide engineering guidance on emergency or remedial measures and, if appropriate, arrange for special engineering assistance. The state conservation engineer is to keep the head of the NTC engineering Staff informed.

504.03 Committee assignments.

(a) An investigating committee is to be named as soon as possible after a problem, deficiency, or failure has been identified. An investigating engineer may be named in lieu of a committee if the cause of the problem is obvious and the practice or structure is minor. Jobs in Classes I through IV usually are considered minor. A committee may be named for these minor structures if the problem is unusually complex.

(b) Committee members or investigating engineers should not have had any significant prior participation in the design, construction, or approval of the practice or structure. State conservation engineers are not to be members of committees in their states. Non-SCS personnel are to be named to the committee only if specifically approved by the Director of Engineering. Sponsors, State agencies, etc, may have observers with the committee.

(c) The committee is to include appropriate specialists such as design, hydraulic, soil, or construction engineers, geologists, or others.

(d) For a minor practice or structure (Class I through IV) the state conservationist or the area conservationist, if so instructed, is to appoint the investigating committee or the investigating engineer. The state conservation engineer is to provide recommendations on membership for the committee.

SUBPART A - PROBLEMS AND DEFICIENCIES

(e) For Class V or VI jobs, the state conservationist is to appoint the committee, based upon the recommendations of the head of the NTC engineering Staff and the state conservation engineer. Depending on the nature of the issue, it may be necessary to arrange for engineers or other specialists from the NTC or from outside the state to serve on the committee.

(f) For Class VII or VIII jobs, the state conservationist and the head of the NTC engineering Staff are to determine the committee membership. The head of the NTC engineering Staff is to consult with the state conservation engineer and the Director of Engineering about the disciplines to be included and the membership of the committee. The state conservationist is to arrange for the participation of the members and issue the letter of appointment.

(g) If the problem is unusual, national in scope, or especially significant, the Chief may appoint a separate board to study the problem. The Director of Engineering is to make the recommendation for the board and its membership. The state conservationist and the NTC director are to be notified when a board is to be established. If an investigating committee has been established, its members are to submit their findings to the board and, as appropriate, serve as Staff for the board.

(h) The state conservation engineer is to provide general guidance and technical support and is to arrange for any assistance required by the committee or board.

(i) The appointment letter is to provide general guidance on the scope of the investigation and tentative schedule. If there are problems or questions about the assignment, the chairman or the investigating engineer is to resolve these issues as soon as possible.

504.04 Procedures.

(a) General guidance in conducting and reporting the investigation of a problem or deficiency is contained in Technical Release No. 24, Investigating Structure Failures.

(b) Because evidence may be obscured by subsequent flow of water, by continued deterioration of the structure, or by emergency repairs, the investigation must begin as soon as possible. Photographs should be made of the site at the earliest possible time by the district conservationist or anyone visiting the site.

(c) The investigating committee is to:

(1) Inspect the structure.

PART 504 - SPECIAL; INVESTIGATIONS, STUDIES, AND REPORTS

- (2) Obtain photographs of the structure and affected areas.
 - (3) Determine the high-water level that prevailed.
 - (4) Interview eyewitnesses and record their statements. Give particular attention to the sequence and timing of events.
 - (5) Determine the time the deficiency was discovered and the time of the last inspection of the structure.
 - (6) Assemble and review construction records such as diaries, reports, test data, as-built plans and as-built reports on construction geology.
 - (7) Review the design file.
 - (8) Gather any other information regarding the event such as precipitation and stream flow records.
 - (9) Define field surveys required to record topography and physical changes.
 - (10) Specify any geologic investigations and soil Mechanics testing needed.
 - (11) Review all communications and staffing assignments during design and installation of structure.
- (d) After compiling the necessary data, the committee or investigating engineer is to:
- (1) Determine the cause(s) of the problem, deficiency, or failure. Support for each cause is to be presented carefully so as to define completely the conditions that led to the problem.
 - (2) Define and support conclusions.
 - (3) List, as appropriate, suggestions on how procedures, criteria, designs, staffing, et(c), need to be changed to avoid a recurrence.
 - (4) When directed by the appointing official, make suggestions for alternative treatments in descriptive concepts and not treatment designs details. This is a secondary purpose of the report.

504.05 Engineering report

- (a) An engineering report is to be prepared for each investigation. The detail and composition of the report is to be consistent with the size, complexity, and significance of the problem, deficiency, or failure.

SUBPART A - PROBLEMS AND DEFICIENCIES

(b) The engineering report is to include:

- (1) A brief description of the committee activities.
 - (2) A description of the structure with pertinent data on name, location, size, age, etc.
 - (3) Appropriate geologic and engineering information.
 - (4) A detailed description and explanation of the situation. Include photographs to enhance the explanation.
 - (5) Enough narrative and data to fully document facts and support findings and conclusions. The report is to discuss where standards, criteria, procedures, or practices failed or were improperly followed. The questions "What went wrong to permit the incident to occur and what would have prevented it?" must be answered to the best of the committee's ability.
 - (6) Pertinent drawings, specifications, reports, etc.
- (c) An abstract is to be prepared for all engineering reports of measures that are Class V-VII. The abstract is used to inform other engineers so they can gain from the experience. The abstract should not be more than two pages and is to include:
- (1) Data on location, size, etc.
 - (2) Description of the problem, deficiency, or failure.
 - (3) Statement of the cause and effect.
 - (4) Discussion of the findings and conclusions. This includes any identified procedure or practice which, if followed, would have prevented or alleviated the situation.
 - (5) Sketches as appropriate.

504.06 Report review and acceptance.

(a) The committee or the investigating engineer is to submit the report to the state conservationist through the state conservation engineer. The state conservation engineer will coordinate the reviews required and upon technical acceptance, forward the report with his recommendations to the state conservationist for distribution.

(b) The state conservation engineer is to solicit review comments by employees who were responsible for preparing the design and inspecting the construction. The state conservation engineer's and the employees' comments are to be attached to all copies of the report. Before the reports are released, they are to be reviewed and accepted as follows:

PART 504 - SPECIAL; INVESTIGATIONS, STUDIES, AND REPORTS

(1) Classes I through IV. The state conservation engineer will determine when the report is technically acceptable. The state conservation engineer will work with the committee to resolve all issues raised. If the report identifies problems resulting from inadequate national specifications, practice standards, or procedures or otherwise merits special attention, the state conservation engineer will request review comments from the head of the NTC engineering Staff. After issues are resolved and the state conservation engineer has determined that the report is acceptable, the state conservation engineer is to submit the report to the state conservationist and indicate its technical acceptance.

(2) Classes V through VIII. The head of the NTC engineering Staff will determine and advise the state conservation engineer and Director of Engineering when the report is technically acceptable. The report is to be submitted to the head of the TSC engineering Staff for review. The head of the NTC engineering Staff will review the report and indicate to the state conservation engineer that the report is accepted or request additional details, study, or other action needed for acceptance. After all issues are resolved and the report is accepted, the state conservation engineer is to submit the report to the state conservationist and indicate its technical acceptance.

504.07 Release and distribution of reports

(a) After technical acceptance and receipt by the state conservationist, the report can be released to others and may be used as supporting documentation for requesting funds to correct problems or deficiencies. Owners, sponsors, State agencies, and others may be given copies after the report is accepted.

(b) As a minimum, copies of the accepted report are to have the following distribution:

(1) Classes I through IV. One copy of the report is to be sent to the head of the NTC engineering Staff. If the report addresses problems resulting from inadequate national specifications, practice standards, or procedures or otherwise merits special attention, the head of the NTC engineering Staff is to forward a copy of the report to the Director of Engineering.

(2) Classes V through VIII. One copy of the report is to be sent to the Director of Engineering and one copy is to be sent to the head of the NTC engineering Staff.

SUBPART B - EMERGENCY SPILLWAY PERFORMANCE

504.10 General.

(a) Thousands of emergency spillways have been installed since 1954 when SCS began using the present procedure for design. Several hundred more are installed each year. Major spillway flows can be expected at several structures each year.

(b) Current emergency spillway criteria are determined by research results reported in Technical Publication 61 (Handbook of Channel Design for Soil and Water Conservation) procedural analyses described in Technical Release No. 52, and the judgment from experience gained over the years. However, most research and field evaluations to date have been on structures with drainage areas less than 10 square miles.

(c) Further research is needed, but laboratory model studies are not always directly applicable and large field models or prototype studies have not yet been undertaken. An alternative is to make field studies of the operation of existing structures.

(d) The purpose of emergency spillway performance studies is to carry out a continuing program to provide information that will be helpful in confirming or improving existing design criteria; give an indication of the upper limits of applicability of various types of spillways; and show the extent and cost of spillway maintenance required after flood flows.

504.11 Scope.

A study is to be made of any earth, rock (except massive, unweathered rock), or vegetated spillway built since 1954 when any of the following situations occur:

(a) The water surface in the reservoir has reached an elevation above the crest of the spillway of 3 feet or more;

(b) The spillway has suffered severe damage, has approached breaching, or has breached to any degree; or

(c) The spillway has sustained continuous discharge for 7 days or more.

504.12 Reporting major flows.

If conditions require a study (see 504.11), the Director of Engineering is to be notified. This notification may be in writing and is to include the site names and numbers, watershed names, and preliminary data on the flows. Send a copy to the head of the NTC engineering staff.

PART 504 - SPECIAL; INVESTIGATIONS, STUDIES, AND REPORTS

504.13 Assignments.

The study of an emergency spillway flow as described in this subpart is to be made by qualified engineers. The state conservation engineer is to recommend the members of the evaluation team to the state conservationist. Hydrologists, hydraulic engineers, and geologists are needed in various parts of the evaluation.

504.14 Procedures.

(a) A performance study is to be made as soon after the occurrence as practical. The study and the report are to consider and document the information listed below and any other pertinent information.

- (1) Name of watershed.
- (2) Name or number of structure and inventory number.
- (3) Location (State and latitude and longitude to nearest degree and minute).
- (4) Date built.
- (5) Drainage area in square miles.
- (6) Height of dam.
- (7) Plan and profile along spillway centerline from entrance to streambed.
- (8) Cross sections at control section and at selected points in the exit channel showing the depth and width of the constructed spillway.
- (9) Geologic map and profiles of the control section and the exit channel.
- (10) Statement regarding the condition of the spillway before the flood event including the density and type of vegetation.
- (11) A copy of the last maintenance and inspection report before the storm.
- (12) Photographs, if available, of prestorm spillway conditions.
- (13) Date of flood.
- (14) Rainfall--depths for various durations according to either official rain gages or a "bucket survey," and the related frequency for each duration.

SUBPART B - EMERGENCY SPILLWAY PERFORMANCE

(15) Runoff--if a stream gage is available, USGS "provisional" data should be included.

(16) Observed or reconstructed inflow and outflow hydrographs at the structure, including maximum reservoir stage and duration of emergency spillway flow.

(17) Physical factors of drainage area related to a weighted "curve number," including antecedent moisture and vegetative cover conditions immediately preceding the storm.

(18) Description of condition on damage in the emergency spillway, including location, depth, and severity of erosion.

(19) Photographs of post-storm conditions in spillway and downstream.

(20) Estimate of volume of soil and rock eroded from various sections of the spillway.

(21) An estimate of the cost to repair the spillway.

504.15 Report.

(a) A separate spillway flow report is required for every flood event meeting conditions in 504.11. If a storm event affects many structure over a wide area, a reconnaissance may be made to determine the need for making a field study on every structure. If this situation occurs, the state conservation engineer, after consultation with the head of the NTC engineering Staff, is to advise the Director of Engineering and reach agreement on the studies needed. An emergency spillway performance study does not in any way alter circumstances under which a problem or deficiency study may be required.

(b) A report is to be prepared for each site except as provided in the preceding paragraph. Two copies of each report are to be submitted to the Director of Engineering. A copy is to be submitted to the NTC director. After the report has been approved and accepted, a copy is to be submitted to the State agency responsible for dam safety and to the owner or sponsor of the structure.

504.16 Review and approval.

(a) The state conservation engineer is to approve the report before it is sent to Engineering or the NTC.

(b) The head of the NTC engineering Staff is to provide comments and suggestions to the Director of Engineering.

(c) The Director of Engineering is to notify the state conservationist of acceptance of the report or of additional data required.

SUBPART C - RESERVOIR SEDIMENTATION SURVEYS

504.20 General

(a) Sediment has a major impact on water quality, water and land use, environmental value, and structure performance. Sedimentation surveys will provide states with more reliable and defensible procedures for quantifying the off-farm impacts of sediment, assessing the effects of conservation practices on these off-farm impacts, and predicting sedimentation rates in ponds and reservoirs. Measurements of the sediment accumulating in reservoirs and determining the physical conditions influencing the sediment yield from the contributing watersheds provide some of the best data that can be obtained on erosion and deposition.

(b) In the early 1970's each state prepared a region-wide plan for sedimentation surveys of selected reservoirs. The plans identified the physiographic areas to be studied, the reservoirs to be surveyed, and the information desired.

(c) This procedure was established to provide a systematic, continuing accumulation of data from which sediment yield predictions could be accurately developed. Long-term records are necessary to establish valid average annual values. This is true because of the erratic nature of erosion and sediment deposition resulting from variations in vegetative cover and rainfall from season to season and from year to year.

(d) Selection of sites and interpretation and analysis of data are to be made by the state for local application. The NTC is to assist states in selecting sites and concur with the selection. The NTC is to develop regional correlations from the data.

504.21 Survey plans

(a) A survey plan for each state is to identify the areas of study, the reservoirs to be surveyed, a proposed schedule of surveys, and the type of information to be gathered. Plans should identify the purpose(s) for which each pond or reservoir is surveyed (e.g., improve farm pond design, sediment storage requirement at planned reservoirs, use of geomorphic variables in sediment yield prediction procedures, identify sedimentation and/or water quality problems, monitor effects of conservation treatment, or identify sediment sources). Ponds and reservoirs should be selected for survey on the basis of suitability to the purpose(s) identified. Installation assistance from SCS is not a requirement.

PART 504 - SPECIAL; INVESTIGATIONS, STUDIES, AND REPORTS

(b) State conservationists and NTC directors are to insure that the survey plans are current and that the surveys are scheduled as a part of ongoing activities. In order for the sediment surveys to provide meaningful information, and since land use and management change with time, a record of land use and treatment must be continuous and current. Plans should be reviewed periodically to determine if continued surveys would provide data useful to both state and national interests. If it becomes necessary to drop a site or to make a substitution, a request is to be made to the NTC Head of Engineering Staff. The request will describe the contributions requiring the change.

(c) These surveys are to be financed from the appropriations that will specifically benefit from the studies.

504.22 Procedures.

The detailed procedures for making these surveys are described in NEH-3, Chapter 7 and in ASTM/D4581.

504.23 Reports.

(a) Reservoir sedimentation reports are to be prepared by the state for each survey as described in "Outline of Report," NEH-3, Chapter 7. The reservoir sediment accumulation data collected are to be sufficient to complete form SCS-ENG-34 and provide the data on related watershed conditions (e.g., soils, surface geology, topography and land forms, land use and treatment, and all types of significant erosion).

(b) States should prepare non-technical summaries of the reports for in-house use and news releases for the general public.

(c) Each report, including completed form SCS-ENG-34, is to be submitted to the NTC for correlation with other reports to develop regional relationships. The NTC's are to assure technical adequacy of the completed forms.

(d) NTC's are to submit copies of completed forms SCS-ENG-34 to the Engineering Division as requested by the Director of the Engineering Division at 5-year intervals.

(e) The Engineering Division provides data from the completed form SCS-ENG-34 to the Subcommittee on Sedimentation, Interagency Advisory Committee on Water Data, which publishes a summary of "Sediment Deposition in U.S. Reservoirs" at 5-year intervals.

SUBPART D - FIELD TRIALS AND EVALUATIONS

504.30 General.

(a) New products, procedures, and techniques are essential in maintaining strong, current engineering activities. These new items become available from time to time. There are requests from industry and others to put these items into immediate use. Many of these items have great potential for use in engineering. Others, while appearing to have merit, may in fact be inferior and unacceptable. Before SCS adopts a product or procedure, it must be determined that it will function as designed and last for the design life. This may require detailed study and testing.

(b) Field trials and evaluations, in conjunction with test data, can provide the necessary support for approving a material or procedure for SCS use. Before a new product or procedure is included in standards or specifications, it must be documented that it will meet design need. Field trials and evaluations are frequently the only methods for developing acceptable data.

(c) Trials and evaluations are to conform to policy stated in 450-GM-403.

504.31 Scope.

Field trials and evaluations are to be considered if there is a need for determining if a product, procedure, or technique can be used to alter, replace, or supplement existing standards criteria, or procedures.

504.32 Approval procedures.

(a) Proposed field trials or evaluations that may change procedures, policy, standards, or criteria are to be submitted to the Director of Engineering. The head of the NTC engineering Staff is to provide comments and recommendations. Proposals are to be specific on the scope of the trial and on the materials or procedures to be tested.

(b) The Director of Engineering is to make a recommendation on each proposal. This may include guidance on the scope and intensity of the study to insure national application of results. This technical recommendation for a study does not constitute approval for expenditure of resources. If necessary, a request for funds and personnel should be made to the Chief.

PART 504 - SPECIAL; INVESTIGATIONS, STUDIES, AND REPORTS

(c) Proposed field trials or evaluations that do not require a variance from standards, criteria, specifications, policies, or procedures may be approved by the state conservationist.

504.33 Study plan.

(a) Generally, the brief statement describing the trial or test that accompanies the request for approval is not sufficiently detailed to define the scope, intensity, purpose, and plan for the study.

(b) The study plan needs to describe fully the need, the benefits, the approach to be taken, the anticipated schedule, and the resources required. These must be in sufficient detail to permit a valid assessment of the potential for obtaining the needed data and of the potential demands for resources-- personnel, equipment, and costs.

504.34 Reports.

(a) An index and a schedule for all field trials and evaluations are to be maintained in each state.

(b) At the time the study is approved, a schedule is to be established for progress reports. These reports are to be appropriate to the trials and evaluations.

(c) When the trial or evaluation is completed, a final report is to be prepared.

(d) Copies of all reports are to be submitted to the head of the NTC engineering Staff and the Director of Engineering. If additional copies are required, they are to be requested in the letter of approval for the study.

SUBPART E - TECHNICAL MANUSCRIPT PEER REVIEW

504.40 General.

Engineering Technology is disseminated to employees through references developed and distributed on a national, regional and state levels. The national distributed materials are itemized in Part 545. These reference materials have had technical review, usually at several SCS organizational levels, prior to their issue. These materials are available to the general public for use and represent the agency's technical papers written by SCS employees and distributed and published for reference by others, represent the agency's best technical capability. When employees prepare papers there is a need to assist them project SCS in the best possible image. There is also a need to assure that the content of papers distributed have high technical credibility. To meet these objectives, a peer review of technical manuscripts is suggested.

504.41 Scope.

Manuscripts containing information on existing or proposed policy, criteria and procedures for engineering (this includes geology and landscape architecture) should receive a peer review for technical adequacy. The state conservation engineers, NTC heads of engineering staffs, and the Director, Engineering Division are responsible for the use of a peer review process by their respective Staff to assure high quality technical manuscripts for presentations and publications.

504.42 Policy.

(a) Manuscripts prepared for distribution at a meeting, but not published in a bound book, proceeding, etc, should be peer reviewed as follows:

(i) Manuscripts prepared by employees in the state, should be peer reviewed by someone designated by the state conservation engineer. At his/her option, the state conservation engineer may request the peer review by a technical specialist in the respective NTC.

(ii) Manuscripts prepared by a state conservation engineer or an NTC technical specialist should be peer reviewed by a technical specialist at the NTC as designated by the head of NTC engineering staff.

(iii) Manuscripts prepared by NHQ Staff specialists should be peer reviewed by a technical specialist designated by the Director of Engineering.

(b) Manuscripts prepared by an employee for publication in a bound book, proceedings, trade magazine, etc, should be peer reviewed as follows:

(i) A manuscript prepared by an employee in the state should be peer reviewed. The state conservation engineer should consider obtaining this peer review at the NTC.

PART 504 - SPECIAL; INVESTIGATIONS, STUDIES, AND REPORTS

(ii) A manuscript prepared by an NTC technical specialist should be peer reviewed by a counterpart technical specialist at the NHQ.

(iii) A manuscript prepared by an NHQ specialist should be peer reviewed by another Staff specialist designated by the Director of Engineering.

(c) Employees are encouraged to have manuscripts reviewed for grammar and readability. Arrangements for this type of review should be made with an employee at their respective office location, i.e., state office, NTC office or NHQ.

(d) To facilitate Technology transfer, a copy of each manuscript should be forwarded to the Director of Engineering. The Director of Engineering will in turn distribute those manuscripts that provide information on applied Technology to all appropriate offices.